

A POOR MAN'S PHOTOGRAPHY
AT THE GREAT PYRAMID.

C. PIAZZI SMYTH.







A POOR MAN'S PHOTOGRAPHY

AT THE

GREAT PYRAMID

IN THE YEAR 1865;

COMPARED WITH THAT OF THE ORDNANCE
SURVEY ESTABLISHMENT.

SUBSIDIZED BY LONDON WEALTH.

AND

UNDER THE ORDERS OF

COL. SIR HENRY JAMES, R.E., F.R.S.,

DIRECTOR-GENERAL OF THE ORDNANCE SURVEY,

AT THE SAME PLACE FOUR YEARS AFTERWARDS:

A Discourse delivered before the Edinburgh Photographic Society

on December 1st, 1869;

BY

PROFESSOR C. PIAZZI SMYTH, F.R.S.S., L. & E.,

ASTRONOMER ROYAL FOR SCOTLAND.

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1870.

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DEDICATED TO THE
Edinburgh Photographic Society,
WHOSE MEMBERS HAVE SHOWN SO WARM-HEARTED
AN INTEREST
IN THE SUBJECT SET FORTH IN THIS DISCOURSE,
AS GREATLY TO HAVE ENCOURAGED,
UNDER CIRCUMSTANCES OF PUBLIC ADVERSITY,
THEIR FAITHFUL SERVANT,
AND
HON. FELLOW,

C. Piazza Smyth.



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P R E F A C E.

AFTER having acceded to request, and printed, as follows, my recent discourse before the Edinburgh Photographic Society in a somewhat revised and extended form, I could not but recognise with more or less of dismay, that although my own ideas of my photographs at the Great Pyramid in 1865 have been from the first, that they were lamentably faulty, imperfect, and unequal—causing me to yearn, though in vain, through each succeeding year, for any opening whereby I might try to replace them with some better attempts—yet in this discourse I have been insensibly led on by the argument to be speaking almost all the time as it were in defence of these very photographs, or as though I thought much more highly of them than I really do.

Yet I trust that the impartial and intelligent reader will easily perceive that my private and theoretic ideal of excellence is not confined to the chance stage which I may have reached in practice several years ago, under rather forbidding circumstances; and if I have so often to allude to certain features of these Egyptian photographs as rather creditable and even worthy of note, it is only for the minute particulars of Pyramid construction which they contain, and as contrasted therein with the more recent photographs, or photozincographs, of a rich

PREFACE.

and powerful coalition in or near London—a coalition which has tried unscrupulously to consign all my Pyramid reproductions to utter obloquy, if not oblivion; and yet whose own works at the same place, in spite of wealth, power, numbers, and more recent opportunities, have not set forth the hundredth part of the exact Pyramid particulars that mine have done; nor have they pointed to any other authorities where the said important data may be procured. They have, therefore, not only attempted virtually to destroy the only known photographic record of certain excellences of primeval workmanship; but, as I shall presently show, what little the coalition has achieved with their own photozincographs, has been carried out in a manner purposely to throw the slur of their own coarseness or failings on the ancient building itself and the august mind under which it was reared.

To set forth, therefore, before the public what are the real powers for accuracy still existing in that grandest of all Primeval Monuments, the absolutely *unique* Great Pyramid—and in so far to rescue its present-day descriptions and modern character from the scientific disgrace just now sought to be inflicted upon it; as well as to demonstrate the service that good and faithful photography in the future may be of there—this is the chief object of the following pages.

C. PIAZZI SMYTH.

A POOR MAN'S PHOTOGRAPHY AT THE GREAT PYRAMID,
COMPARED WITH THAT OF THE ORDNANCE SURVEY
ESTABLISHMENT SUBSIDIZED BY LONDON WEALTH,
UNDER THE ORDERS OF COL. SIR HENRY JAMES,
R.E., F.R.S., DIRECTOR-GENERAL OF THE ORDNANCE SURVEY,
AT THE SAME PLACE FOUR YEARS AFTERWARDS :
A Discourse before the Edinburgh Photographic Society, Dec. 1, 1869.

MR. CHAIRMAN AND GENTLEMEN,

ALAS ! how seldom does it happen that a scientific man can set to work at his most favourite and even important subject of research with all the instruments of observation and apparatus of record that his intellect imagines or his heart desires !

At all events, in original inquiries, in the pure walks of science for its own sake alone, the usual question with each ordinary private scientist is *not* "What is the most powerful machine that can be brought to bear on some difficulty in knowledge or obstinate mystery in nature ?" but, "What is the cheapest possible method by which any sufficient result may haply be obtained ?" And if this be the prevailing form of the apparatus question at present, in general branches of practical science, much more must it rule in the particular branch of *photography*, which, according to its scale, eats off its head in silver baths ; and much more entirely must it dominate there when that photography is being exercised during travel in foreign parts. Yet every traveller in strange lands ought to photograph ; and the vital problem, therefore, is, "How shall such traveller, if a poor man, accomplish it ?"

Now pray do not fancy that because the man is poor his work must, therefore, be necessarily bad, and his experiences uninteresting ; for some of these same poor men are precisely the most am-

bitious souls after excellence in all society. Urged, too, by their very poverty, they often strike out useful inventions; and though, if measured by a mere material foot rule, their instrumental apparatus may too often appear pitifully small, by exactly so much has it more promise of entering into, and passing through, the eye of the needle of nature than the ponderous coaches of the rich.

Many other poor men before me have already described to this Society, and many others after me will also, I trust, continue to describe, how they have accomplished one difficulty or another in photography, despite slender means and forbidding circumstances; and I therefore only appear now as one of a large and acknowledged band of workers, neither the first nor by any means the most worthy, but simply as one under a very peculiar pressure, *i.e.*, as one compelled by a sudden combination of rich, hasty, and unscrupulous opponents, either to speak out on the instant before the world, or to let a favourite subject of study, during several earnestly-spent years, disappear at once and for ever beneath the heap of erroneous assertions, disparaging treatment, and *bad* photography which those opponents have contemptuously cast upon it.

What, then, can a poor man, and one who believes in the truth of his subject and goodness of his cause, choose to do in such a case than make a stand and speak out?

But will the Society care to hear what he has to say? That will doubtless depend in part on the intensity of the difficulties struggled with, and the degree of success with which they may in part have been overcome. These points, therefore, I will first discuss, treating them in and for themselves alone; and then, if you still approve, we will apply the final test, or that of comparison with the works of the opposite party.

HOW THE POOR MAN PHOTOGRAPHED IN EGYPT IN 1865.

When I went to Egypt just five years ago, I went—though accompanied, encouraged, and assisted by my constant helper, the partner of all my joys and sorrows—yet I went—I may say generally, alone, a private individual and a poor man. I only, in this

country—save, perhaps, one other person—then saw the exceeding importance of modern scientific examination being applied without further delay to that most ancient architectural monument of all the earth, the Great Pyramid. I alone would run any risks with regard to it; and therefore, except the helping hand which one acute reasoner and far-seeing as well as generous-minded man voluntarily and spontaneously held out, I was left by both Government and all other authorities to find my own way to the Pyramid, and pay all expenses there out of my very slender salary, not calculated to bear any such burden.

The strictest economy, therefore, had to be the order of the day; and as several other subjects of scientific observation, of a very engrossing character too, required prior attention, there was sadly little left for photography.

But photography must be taken; for what monumental research of the present age can be effectively treated without its marvellous aid. It *must* be taken, but the apparatus could only be *very* small.

METHOD FOR SINGLE NEGATIVES.

So far as dry plates were concerned, I had a camera capable of taking negative pictures so large, for me, as three inches square, and I live to regret the extravagance; for the special apparatus which I had also made at the same time for wet plates showed that one inch square, or indeed only as large as one's thumb nail, was quite enough, if properly employed, for any ordinary angle of view.

How that wet-plate apparatus, in taking single negative pictures was managed, I do not enter into now, because in the month of May, 1866, when my own time was over-occupied in preparing my book, *Life and Work at the Great Pyramid*, the novelties of the method were described—and very well described—to this Society by their then able Secretary, Mr. John Nicol, and his account was reported in full, as well as illustrated, in *THE BRITISH JOURNAL OF PHOTOGRAPHY* for June 8th of the same year.

METHOD FOR DOUBLE NEGATIVES.

But the taking of the double or stereoscopic negatives was not

then touched on ; and as they furnish points illustrative of the restless craving after improvement properly characteristic of the poor man, and not unworthy of adoption elsewhere, I will venture to say something upon them now.

While the rich public has, of late years, generally settled down into a state of apathetic content to have their stereographs of every kind of subject, with the single exception only of the sun and moon, treated with no more stereographic power than that resulting from the three-inch distance apart of the lenses of an ordinary binocular camera (an unhappy invention, from the date of which the present almost total decay of public interest in stereographs took its disastrous rise), the *poor* man, in this case provided himself with two separate cameras, capable of being fixed, according to the subject treated and the purposes it was wanted for, at any distance asunder, from three inches to three feet, and occasionally much more. And he applied to the two cameras a connecting bar to make the motions of their internal shutters—already described for a single instance by Mr. Nicol—exactly similar, simultaneous, and instantaneous also, if required,

This double apparatus I now exhibit, battered and bruised, as it came home four years ago from the campaign of the pyramids ; and you will observe that one movement of one hand in one direction is enabled both to open and close the apertures of both cameras either quickly or slowly—slowly enough to suit the faintest objects at sunset ; or quickly enough, as actually proved by an experiment, to take a bird on the wing.

METHOD OF SINGLE POSITIVE COPYING.

Let us now suppose that all the negatives required have been obtained in the field, and by two opposing parties. The rich man's servants have brought home his large glass plates in ponderous boxes ; and then they busy themselves, according to his orders, in copying the negatives by the simple mechanical method of superposition, producing thereby positive copies in either silver or carbon, photolithography or photozincography—a dull and not

very artistic or suggestive method, because it merely reproduces in positive just the scope and scene of view which was taken in by the mere material sides of the camera at the place.

Not so, however, acts the poor man, with his little box of very little negatives brought home modestly in his waistcoat pocket. Therewith he sits him down at a table, having a compound achromatic microscope before him—either the ordinary single one, or a double one like this now exhibited, and intended for viewing two pictures at once stereoscopically—and then, revelling in the marvellous magnifying power of that admirable optical instrument of modern times (which we owe mainly to the father of the latest elected, and not the least, of the professors in the Edinburgh University, Mr. Lister), the *poor* man wanders at will, truly the monarch of all he surveys, over the various parts of each picture; recalls all the circumstances under which it was taken; discovers characteristic detail which he never dreamed of before; and then—each picture you will remember having been taken *square*—he decides whether a positive copy should be shaped as a long, *i.e.*, horizontal, rectangle, or as a tall, *i.e.*, vertical, rectangle; whether it should include from side to side of the negative plate, or stop short of its extremest parts, in order to secure a better balance of light and shade, or a more harmonious composition of lines and angles; whether he should give preponderance to the sky or to the foreground; or whether some special scientific purpose may not be better served by extracting one little subject alone out of the whole scene, and making a very highly-magnified picture of that one item by itself.

With all these notes taken at the microscope, the poor man then inserts his little negative into a copying and magnifying camera, and proceeds to realise all these various positive pictures, hitherto only sketched out in art or scientific idea, and makes them of any size that he can afford.

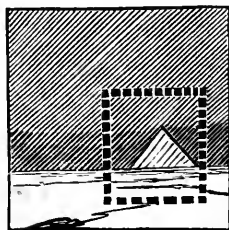
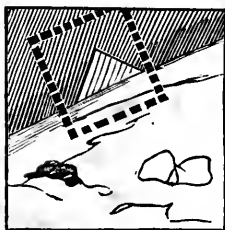
The twelve small pictures shown at the upper end of the room (all of them pure photographs, without any of that falsification which arises from touching up, stopping out, printing in other skies, and

such like improper and untrue tricks), are a sample of about 150 that I prepared in this way for the oxyhydrogen lantern, and of which the more effective have been freely exhibited again and again on large screens before many public audiences. The rather larger ones at the lower end of the room are the remains of a set of about sixty, twice partly exhibited in public, and were prepared originally with a view of making octavo-sized book plates; while the middle set of twenty quarto-sized glass plates are the commencement of a new series never exhibited in public before this evening.

In the way of definition, I may call attention to No. 24; for, although it is magnified up to 10×8 inches from one of the small or one-inch-sized negatives, and although the Arab before the tomb door occupies only a subsidiary portion of the whole scene, yet the threads composing the cloth of his garment are discernible in those parts not affected by his breathing. No. 25, on the contrary, is an example of bad definition; but that is from a dry plate of the needlessly clumsy size of three inches square.

METHOD OF DOUBLE POSITIVE COPYING.

So far, then, for single copying. For the stereoscopic copying, however, there was required something more than the ordinary "copying and magnifying" camera, seeing that the problem in this stereoscopic work is—given two pictures on separate glass plates, it is required to make a stereoscopic pair from them, or any small part of them, on one glass plate and by a single copying operation: the original pictures, too, being perchance by no means

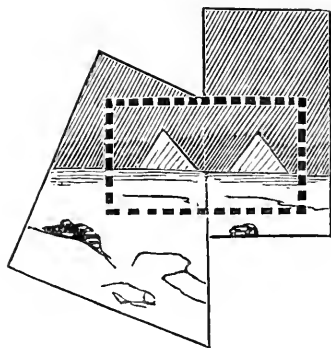


symmetrically placed (by error of adjustment of the glasses in the bath-slides, or otherwise) on their respective plates, as in these two diagram examples, where the dark surface shows the sky of the negative, and the small dotted rectangle the only portion of the whole scene required for the stereograph now in hand.

We must begin, then, here with a new copying camera, or a new head to the old one, having two object glasses, distant from each other, horizontally, centre to centre, a quantity to be decided by the particular human eyes and instrumental stereoscopes afterwards to be employed in viewing the finished pictures, and which distance I have settled for myself and a superior class of achromatic stereoscope presently to be described at 2·7 inches.

We next put the two negatives into a double frame, like this now exhibited, to carry them in front of the object glasses, each half of the frame being so provided with three adjusting screws and antagonistic springs that each negative may have three motions given to it independently of the other, viz., horizontal, vertical, and rotatory in its own plane. By these means we may get the magnified images of the required parts of the negative on the greyed focussing glass very exactly side by side, on a level, and also with their objects in their own middle pictorial distance at the precise 2·7 inches apart—a very important feature to be attended to for the comfort of future spectators.

But we cannot yet take a copy of these semi-Siamesed fragments on a photographic plate, because the images of the parts we want are overlapped or even covered by images of parts we do not want. To remedy that evil a vertical axial diaphragm, also now exhibited, is introduced inside the copying camera, toothed to avoid reflections of light being thrown towards the picture, and pushed up just such a distance in front of the ground glass that, while it still completely prevents one image overlapping the other, it at the same time annihilates its own shadow, and allows one picture to melt into its intended partner at an invisible line, thus:—



and we may then copy off, on a single stereoscopic glass plate of the usual size, and at one opening of the camera, just the double rectangle marked out, neglecting all other parts of the two pictures necessarily, because they are beyond the limits of the said stereo. plate. Occasionally one of the two separate negatives is lighter than the other, and reproduces itself on the collodion plate more quickly; but the extremest difference yet found has been corrected and equalised to the slower member of the pair, by having two or three plates of so-called transparent, but, in reality, slightly greenish glass placed between the paler negative and the source of illumination, generally a window looking towards the north.

In this manner have been prepared the twelve stereographs now on the President's table—all derived from various parts of these same small, or one-inch-sized, negatives, but all equally magnified up into pictures, each member of which is 2·7 inches broad and 3·25 inches high; * and I leave it to gentlemen present, after the

* The 2·7 inch breadth of picture I have found also to be followed very nearly by several eminent producers of transparent stereograms on *glass*, both in France and America; although the opaque stereograms on *paper* of the same and other parties are usually 3 inches and even 3·25 inches broad. The reason of this difference is mainly, that the stereoscopes generally used for the glass pictures are of more magnifying power than those employed for the paper ones. The latter, indeed, will not bear much magnifying without showing the texture of the paper and other mechanical imperfections; and as no one looks for much accuracy of any kind on paper, distorting and

formal meeting is over, to try them, and say whether they do not find both a satisfactory amount of stereoscopic effect and no strain on the eyes—at least, when they look at them with the form of stereoscope which I have arranged for myself and for these Egyptian pictures; the chief characteristics of such stereoscope being, besides a stand with reflector and angular adjustments, achromatic lenses of unusually large (1·8 inches) diameter and short (3·6 inches) focal length, together with, over and above the ordinary focussing adjustment, a right and left-handed screw movement for the convenient alteration of the horizontal distances of these lenses apart to suit the eyes of each spectator. Indeed, this last adjustment is so exceedingly important to get the best optical performance without strain on the eye and the brain, that it is my private opinion that no stereoscope should be offered for sale without it.

COALITION OF RICH ONES AGAINST THE POOR MAN.

Such, then, has been, in so far—or sadly below his original aspirations and his hopes too of practical success should a second occasion ever become possible to him—the poor man's performance of the photographic part of his work at the Great Pyramid in 1865. And that was work, or, rather, labour of love, exercised in as grandly promising a field and noble a cause connected with the earliest origin of nations, the source of inspired Patriarchal religion and the manner of commencement of all human civilisation long before written history began—as time has yet opened up before the modern world—but which the said world was by no means fully appreciating, when the poor man threw himself into the gap. But the work itself, first in all its details, and then as indicative of its really glorious cause, after three more years of untiring labour at home, the same humble servant of science has endeavoured, though at still further ruinous expense to himself, to set before the public in his several printed volumes, entitled *Life and Work*

dispensing *prismatic* lenses are also permitted, chiefly in order to facilitate the superposition, to the eye, of the extra-broad pictures. But this is evidently not the way to procure the highest excellence of optical results.

at the Great Pyramid, and *The Antiquity of Intellectual Man*, and also in papers printed in both the *Transactions* and *Proceedings of the Royal Society of Edinburgh* for 1866-7-8; and now, after almost two years more have passed away, and when the human mind is at last just beginning, at some few points far between, to kindle into intelligent appreciation on the important Pyramid subject, and when hardly a week passes without some correspondent or convert appearing from as far East as India, or as far West as the United States of America—what think you has been close to him, in his own land, the poor man's cheering and most encouraging reward?

It has been this:—A coalition of rich individuals in and about London, has recently burst into his subject, animated apparently by some special feeling against any high knowledge having existed in ancient days, and a determination to upset every thing that the long labours of the poor man, following faithfully in the track first pointed out by the late *John Taylor*, have succeeded in disclosing. A few weeks ago, accordingly, he had the honour of receiving from that influential London party, and under a cover inscribed "*On Her Majesty's Service*," besides being marked as one of the public *Documents of the Ordnance Survey* of Great Britain, this pamphlet, entitled *Notes on the Great Pyramid of Egypt, &c., &c.*, by Colonel Sir Henry James, Royal Engineers, and Director-General of the Ordnance Survey; and wherein, although the writer gives something of a *catalogue raisonnée* of all authors and measurers of note or value at the Great Pyramid, from Professor Greaves, of Oxford, 230 years ago, down to and including his own officers and men this last spring, yet he has carefully omitted all mention of the poor man's name, books, measures, photographs, and everything else of his labours at the Pyramid:—that is, all direct mention of them; for the autocrat of the pamphlet indulges on another page by indirect insinuations and nameless abuse, sufficiently interpretable, in denouncing all of them (though on little more than his own erroneous representations) as being neither more nor less, in his estimation, than vicious absurdities, extravagant nonsense, and folly

worse than anything, even than "the crystallized mud theory" of dark times during total ignorance of all physical science!

Now is not this agreeable information for the Astronomer-Royal for Scotland, though working at this subject in his private capacity only, to receive "On Her Majesty's Service" (if, indeed, that is true), and to be told that the pamphlet containing it all is expected not only to serve for the Pyramid information of grown persons, but to be used also, far and wide, for the same instruction of the rising generation "in our national and other schools;" and finally, that the principal expense of this onslaught upon him has been most liberally and generously defrayed by that so wealthy lady in London whom he has never seen—Miss Burdett Coutts!

Can I, or ought I, to be altogether silent in such a case? Could I have been treated worse if I had gone to the Great Pyramid only to destroy it; and, as its bitter enemy, to depreciate its original mechanical structure and undervalue the ability and intention of its primeval designer? Well, I will not attempt to say much on those points just now, because—as I have already demonstrated elsewhere, a large number of both the blunders and something worse of this too remarkable pamphlet in its *literary* and *numerical* portions—it is better here to examine only its *photographic* contents, and to inquire with regard to them before this experienced and in the art-science learned meeting—What is there in the photographs of the pamphlet just issued by the rich and powerful Pyramid coalition in the south to justify them in their out and out attempt to stamp on, abuse, and drive out of existence the poor man's previous work of the same order, but far more abundant and in some things much more accurate, in the selfsame field?

THE RICH COALITION'S PHOTOZINCOGRAPHS IN 1869.

Now the photographs, or photozincographs rather, of the coalition pamphlet being only four in number, will not occupy us very long in their examination; and they are all arranged before the room in one view on the front of the President's table, while the President himself has another copy of the pamphlet in his hand.

Case 1.—The *frontispiece* of the pamphlet, though fair enough in general effect, is rather anomalous in its place, seeing that it does not represent anything about the Great Pyramid at all, but the Mohammedan-built Nilometer near Cairo. Nor is it even as such represented sufficiently well for scientific purposes; for, besides the absolute sizes not being given, you will find, if you take compasses and measure differentially the cubits on the central stem, that both their lengths and breadths decrease continually from centre to either the top or bottom of the picture, showing that the photograph labours under the well-known evil of barrel-shaped distortion in the lens employed.

In such a case the *poor man* would have applied the same method of correction which he actually did employ in the same country four years previously, when he supplied himself with these black and white measuring rods—some 50 and some 100 inches long—and fixed or hung them about any important subject which he photographed: as, in fact, you may recognise in many of his pictures now exhibited, and test the dimensions of objects represented there by means of the very scales you now see before you.

Case 2.—The next photozincograph, or that marked “Plate I.,” is stated in the description to give the form of the Great Pyramid: and it is, moreover, the only general and entire view of the Great Pyramid in the pamphlet confessedly upon that monument. We turn to the plate, therefore, with anxiety, hoping to study there minutely the intimate structure of the most pure and blameless building ever erected by man, the only known ancient building neither defiled by the worship of false gods nor inscribed to human glorification;—when lo! by a mere trick of the soldier photographer, the most prominent object of the scene is made to be, not the Great Pyramid, not the best remnant of peaceful Patriarchal days that has come down to our latter and war-oppressed times, but that atrocious and biggest idol of all the earth, the so-called, but very different, Great Sphinx.

So far away has the Pyramid been put, in order to allow this dreadful Sphinx of another age to shove its noseless face into the

foreground, that nothing of the successive courses of the Pyramid's masonry, and many other equally important features, can be made out on the paper of this Ordnance photozincograph. If, therefore, you honestly want real information on the Great Pyramid masonry, you must come back, after all, to some of the *poor* man's unmentioned but previously-existing photographs, such as Nos. 13, 37, 17, and others, where you may study that masonry's various forms and instructive methods without interference from totally extraneous objects.

Case 3.—But the third photozincograph of this pamphlet, or that marked there “Plate II.,” ought to be something vastly better when the introduction says of it:—“The manner in which the Pyramid was originally cased may be seen in the photozincograph No. 2, which represents the second Pyramid, * * on which the casing stones of the top still remain in their places.”

Now these things are, without doubt, very important in Pyramidology; we turn, therefore, eagerly to behold them, when lo! that horrid, monstrous idol—that idol of all idols, the Sphinx—stares us full and broad in the face once again, and from the best part of the foreground!

Were the Royal Engineers taken away from their proper employments in this country, and sent out to Egypt to do honour, and worship, and reverence to that iniquitous remnant of old idolatry, the half-bestial Sphinx—or to measure the Great Pyramid and illustrate the scientific refinements of its masonry so absolutely pure from all idolatry, whether of man or of false gods?

Let the Royal Engineer's works answer for them; and for all that they, or the Ordnance Survey, or their subsidisers, would, if they could, under another name, teach the poor little innocents “in our national and other schools.” Yea, indeed, let their works answer for what was in their hearts, especially when contrasted with the poor man's picture, No. 14, representing in large the very identical casing stones of the second Pyramid, and nothing else unconnected, which the Royal Engineers ought to, and might, have given us on this occasion.

CASE 4.—THE SOCKETS OF THE GREAT PYRAMID MISREPRESENTED.

But surely the last photograph of the pamphlet will make up for all these various defects of the earlier ones, especially as it is said in the introduction "to show the position of one of the sockets with reference to one of the present dilapidated corners (the north-east) of the Great Pyramid, with one of the Royal Engineers holding his staff in the farthest angle of the socket."

There, too, sure enough, you may see the Royal Engineer holding up a black and not very straight stick—possibly his walking stick. But where is the all-important socket? There is absolutely nothing identifiable as such! Was there, then, no proper socket in existence, no fiducial socket at that angle to receive the corner stone of the outside or limiting casing of the venerable structure, and assist thereby in marking out the exact original size of its giant base to all posterity! Was there really no such socket in existence at that corner of the Great Pyramid when the military photographers were there? Or, have they photographed the surface of wretched, loose, mere dust and rubbish, filling up and concealing the socket, and called that miserable stuff by the veritable name of the accurately carved and almost mathematically true socket, hollowed by the orders of the ancient architect for a special and important purpose, in the still sound, and perfect living rock of the hill?

The question is a serious one as affecting the credit and ability of the ancient builders compared with their modern successors; and bears also not a little on the grand disputation of the day as to whether civilised man's career has been a continual history of self-development from a previous lower stage, even originally of savagedom and bestial ignorance; or whether his early period upon earth was something totally and essentially different from that, as, indeed, the Bible teaches us that it was.

These sockets, however, of the Great Pyramid are, most fortunately, matters on which Sir Henry James, though he has never seen them, would claim for himself a most extensive and intelligent acquaintance, and from the grandeur and power of his posi-

tion, with subsidised officers and men for the work, he expresses himself thus contemptuously of certain poor and *unsubsidised* individuals, who, in spite of their poverty, had already visited, and worked to the utmost extent of their means on, the scene. "Considering," says Sir H. James, "the number of people who have undertaken to measure this (the Great) Pyramid, it is very remarkable that no one had measured all the four sides (of the base, from socket to socket) before Mr. Inglis did, and more especially because the positions of the sockets were known to within a foot or two, and they were only covered by a little sand easily removable by the hand; and nothing could be more simple to any practical engineer than to measure the distances between their extreme corners."

Now, this statement is at each and every step of it in such utter, such flat, such merciless contradiction of what I had already published in my *Life and Work at the Great Pyramid* and elsewhere, and is so entirely unsupported by any proofs, facts, or arguments beyond the assertion of a high military chief, who says it is so; and I am so evidently the main person alluded to under the term of "people," meaning those vulgar, and as having disgracefully neglected to do what a certain Mr. Inglis is stated to have done immediately after, and independently of, me—that I can only turn to my faithful photographs, which cannot lie, and set forth what they contain.

It should, indeed, have been mentioned by Sir Henry James that Mr. Inglis was just as completely subsidised for his work at the Great Pyramid as were his own Royal Engineers, having been paid to do it by his employer, Mr. Aiton, then a very wealthy man, and allowed by him to engage as many Arabs as he pleased to assist; and it was by their excavations, aided in the case of two out of the four sockets by my voluntary assistance in advising where to dig, when their own efforts had failed, that Mr. Inglis and party stood at the end of April, 1865, in a position never occupied, I believe, by any explorer at the Great Pyramid before, viz., of having all four of the corner sockets visible at one view.*

* The French, under Bonaparte, in 1799, were the first to discover, by

But Sir Henry James would have it inferred that every one knew the place of all the said sockets before "to within a foot or two:" and partly because, as he more especially declares, "they were covered only with a little sand easily removable by the hand," so that, in fact, it would be false to talk of any excavation, or pick or shovel work, at all. Indeed, according to him, Mr. Inglis ought not to have sent in bills to Mr. Aiton charging for the hire of two large posses of Arabs for several days with their iron instruments of excavation in hard and stony ground; for Sir Henry James states positively and officially that at and before that period "the sockets were covered only with a little sand easily removable by the hand," and Sir Henry James is a Colonel of Engineers.

Now desert sand is very easily distinguishable in a photograph, as it is also by all its physical and chemical qualities, from the lime-stone rubbish of a ruinous building. The photographs then, they are the things to settle the assertion of the Director-General of the Ordnance Survey; and how fortunate for Mr. Inglis that I had taken some of these faithful testimonies of the Pyramid both before he arrived there, and also took others afterwards, specially to show what the sockets were like, and what material he had had to break through in order to expose them, after their long entombment, to the blue sky of heaven once again.*

excavation through the surrounding rubbish, two of the Great Pyramid's ancient sockets, or corner-stone foundation holes, showing how far its base had once extended before the dilapidation of its flanks began. These sockets were the north-east and north-west. The north-east one they have carefully engraved a plan of in their great Egyptian work: and though speedily covered again with rubbish, that socket was once more opened by Colonel Howard Vyse, in 1837, and has been seen by many persons: yet on my arrival at the Pyramid in January, 1865, there was nothing of it then visible on the surface of the ground. But of the north-west socket the French work gives no plan, and it was one of the two which Mr. Inglis and the Arabs failed to find by all their digging at guess.

* The north-east and north-west possibly after a sleep of only ten to thirty years; but the south-east and south-west possibly after one of a thousand years.

SOCKET-PROOF BY THE POOR MAN'S PHOTOGRAPHS.

Let me first, therefore, direct your attention to my photograph No. 25. It represents the south-west foot of the Great Pyramid, and the ground in front of it, *before* Mr. Inglis and his Arabs began their work of excavation. No socket is there visible and no sand ; only the hard and flattened surface of semi-concreted limestone soil strewn with stones.

But in No. 26, taken *after* those excavations, and after my assistance had been asked and given to help the excavators to find the socket by application of John Taylor's Pyramid theory, their own practical attempts during several previous days having ended in failure, and in proving that *they*, at least, did not know "its position to within a foot or two,"—behold the depth !—much more than a hand scrape, for it is near thirty inches that they had to dig (on my directions) before they came to the socket; and there see its exquisite white and levelled surface of actual rock *in situ*, as well as the hard and stony composition of the rude rubbish ground above that had to be cut through in order to get at it. And in looking at that socket too, behold a recovered feature of the ancient Pyramid architecture not improbably alluded to by the inspired patriarch Job ; and a feature all whose excellences of mechanical shape, size, hardness, and truth, were necessary to the character and endurance of the monument through the more than forty centuries that it has survived ; but a feature which, so far as this south-western socket is concerned, instead of being known to every one, was never described in any European work on the Great Pyramid, so far as I am aware, until I described it and gave the measures thereof in my *Life and Work*, two years before the Royal Engineers went to Egypt.

Then No. 27 similarly shows the ground in front of the north-east foot of the Great Pyramid *before* the excavations began ; and, again, no socket is visible and no sand, only hardened lime-soil, and stones. But *after* the excavation, behold the socket, the real and ancient socket—admire, too, its well-cut and admirably levelled floor in both No. 28 and No. 29 !—a witness it is (clothed

in its own pure white, and almost twelve feet square) to speak to the unrivalled workmanship of the ancient builders, and still more to the comprehensive far-seeing design of its primeval architect. There, too, is Mr. Inglis (Mr. Aiton being then absent in Palestine) with his foremen of Arab diggers, the two shieks of the Pyramid : there, too, is my attendant, Aleo Dobree, who *would* insist on putting himself into the picture, for had he not brought up and adjusted my measuring bars which were to be photographed to give the scale? and Mr. Inglis had just before told me with wonder and admiration, "I have levelled all over the floor of the socket with my spirit level, and can find no error in it." Only think what a testimony is not that to correct work after 4,040 years have passed away! Will it be said of any of our works, after a like amount of time has elapsed, that men of that future day, with all their improved instruments of precision, can find no error in what we have done.

No. 30, again, shows the socket at the north-west corner of the Great Pyramid, and you see there the same white level floor and the same stony soil that had to be cut through (upon my indications in this case as well as in that of the south-west socket, obtained only by theory and angular measures, after the practical plans of both Mr. Inglis and the Arabs had totally failed) before it was discovered. And, finally, No. 31 shows the south-east socket, the smallest but the deepest down of all the four sockets of the Great Pyramid, and covered it had been with the thickest and stoniest coating of rubbish, concreted almost into very rock. In the presence, indeed, of only this one photograph, and fortified by that regard which all the world is rapidly acquiring for the remarkable *witnessing* capacities of the art-science of photography, I would ask the President formally—Lives there, sir, the man—in Scotland at least—with hands so hard or horny, or so totally unlike human hands, that he could, whether easily, as Sir Henry James declares of himself, or painfully, as I should fancy, have grubbed out that hole and cleared that socket in that material, as you see it before you, with his hands alone? Take your magnifying glasses,

gentlemen, and examine the rough and angular stones still sticking in the steep sides of the hole. Look at them, also, in the stereoscopic view, No 48, on the table; remember, too, the cementing nature of lime-stone dust, washed by occasional rains and exposed to pressure, and then pause before any of *you* undertake the task which the Director-General of the Ordnance Survey of Great Britain has laid himself under something more than moral obligations, both to the public in general and Miss Burdett Coutts in particular, to perform with nothing but his "bare hands."

STATE OF THE BASE SIDES OF THE GREAT PYRAMID.

Inasmuch as Mr. Inglis's linear measures of the four sides of the Great Pyramid's base from socket to socket, were made in intimate concert with myself, I relieving him of the more difficult duty of taking the angular measures required, both geometrical and astronomical, and he giving me in return—with the subsequent consent of his employer and paymaster, Mr Aiton, and expressly for publishing as I have published, and was the first, if not still the only, person to publish—his full and detailed linear measures, Sir Henry James might have said something of both Mr. Aiton and myself as necessarily connected with those measures. But he has preferred to give *all* honour to one, who (though very commendable in his own place) neither did the work on his own idea or expense, nor published it to the world, and to fling dishonour on every one beside.

It was no doubt an important contribution to Pyramidology when I was first able to publish the only set of measures that had then ever been taken in modern times on all four sides of the Great Pyramid from socket to socket, yet I explained both then, and subsequently, why that result must be looked on only as a distant approximation to the truth; the main reason being that, over and above Mr. Inglis and Mr. Aiton too, having had no sufficient measuring apparatus with them, an amount of excavation and clearing of the ground would have to be performed before all the parts to be measured upon became visible, that must inevitably

cost several thousand pounds—a sufficient obstacle surely in the way of any *poor* man unassisted.

But Sir Henry James, the official representative of this country's accurate surveying, has declared, as you have just heard from the coalition pamphlet, that at that very time “nothing could be more simple than to measure the distances” between the sockets, *i.e.*, to determine the correct length of the ancient base-sides of the Great Pyramid.

Now when he says that “nothing could be more simple,” we are entitled to assume, over and above all the sockets being discovered and cleared, which has already been proved in the negative, that each pair of adjacent sockets, being the terminal stations of their own base-sides, could “see” each other: for that is a *sine qua non* for the ends of every accurate base-line that has ever been measured anywhere, and especially for those measured by Sir Henry James's predecessors in his important office, with Colonel Colby's celebrated Ordnance compensation bars.

And yet, will it be believed that of all the four sockets of the Great Pyramid, not a single one can see any other: and that not by a narrow graze only, but by reason of a huge, high, long, and broad hill of stony matter lying right between every pair of them: so steep in some places as to be next to impossible even to stand upon, and so made up of stones jammed, wedged, and concreted together, as to be very difficult to make any sensible impression upon either with spades or pickaxes!

Something of this might perhaps be inferred from the lamentable failure of Sir Henry James's own men to bring home a decent measure, he having found it necessary to cut no less than *ten* whole inches off their result, in place of showing that it was true to within something like the hundredth of an inch. But the *whole* of the damaging statement must be received and allowed, because these four intercepting hills are duly represented in the poor man's photographs of the Great Pyramid, and in a manner that enables their dimensions and constitution to be nicely ascertained.

Thus refer, if you please, to my photograph No. 7, or a view of

the west side of the Great Pyramid, and you will see that the central mound of its base-side rubbish rises there to within nineteen courses of a very conspicuously thick layer of masonry, which is the thirty-sixth from the bottom, and is traceable at the same height on every side of the Pyramid, all whose courses are horizontal and parallel. We have, therefore, the lowest sixteen courses at least of the Pyramid left to measure the vertical height of the long top of this adventitious heap of modern rubbish; and the united thicknesses of those courses, according to the measures of the French Academicians in 1799, as well as my own in 1865 (you will look in vain for any Ordnance measures of them), amount to close on 600 inches. That is, proving a hill of compacted stone rubbish 600 inches high at its culminating point: and it is also nearly 7,000 inches long and 1,200 broad; opaque enough too, surely it must be, to prevent any living man at one socket seeing, with mortal eyes right through the central line of this hill's whole length, anything of his fellow observer standing at the next, but yet far off, corner socket.

The rubbish mound on the south side, similarly tested by my photograph No. 9, is proved to reach rather higher, or to 680 inches in vertical height above the Pyramid pavement or true base; while the heap on the east side rises to 630 inches of vertical height, and that on the northern side to close on 600 inches.

This last one was *cross-cut* in three places by Colonel Howard Vyse, in 1837; and he employed for that purpose several hundred Arabs during many weeks. But to have cut through it *longitudinally*, so as to enable one socket really to see the other, and to show all the remnants of the pavement and actual base-side of the Pyramid required to be measured upon, as well as the sockets, and to accomplish that by so broad-floored a cut all the way as to allow the Ordnance compensation bars with their tents, microscopes, and tripods to be employed in measuring the distance between, would have required thousands of Arabs. Yet to make so long and broad a cut or clearing is what Colonel Sir Henry James is, in honour, bound to do; and that not only on the north side, but the east, west, and

south sides of the Great Pyramid also, before his statement in derogation of unsubsidised "people" at the Pyramid can be made decently true for the future, though not for the past.

We can only hope, therefore, that his most liberal patroness will supply the Director-General of the Ordnance Survey with money enough to engage many thousands of labourers; or otherwise he may be driven—before he has accomplished with his own hands the removal of the "perfectly simple" obstacle—may be driven, I say, to end his days as a mere navvie working at an interminable task.

OF THE GREAT PYRAMID'S STILL EXISTING POWERS FOR ACCURACY.

But though I may hope so fervently that his generous coalition friends will supply the Colonel with funds enough for the above preparatory purpose of dealing with mere heaps of modern rubbish, I cannot be equally anxious that the replenished knight should be so much further endowed as to enable him next to attack the Great Pyramid itself, and become our final authority for the accurate mensuration of either its base-sides, or, indeed, any of its other original and ancient fiducial markings.

And why so, do you ask?

I have already shown (see Appendix pp. 11 and 20) that he has tampered with the published numbers of the Great Pyramid's base twice over, to make them suit his own mere fancies of what ought to be, in a manner that would have ruined any smaller man for ever; but which, on the principle, apparently, of that being but a choleric word in the captain which in the soldier is flat blasphemy, seems to be thought so little of in him—that I must endeavour here to add to that sin in a poor man some further proofs from the Colonel's own photozincographs that he is acting more against, than for, the Pyramid in all the precious and fiducial points of its construction: so that we need never expect from him any correct account of the Pyramid's accurate features, though it is on them alone that all our hopes rest of being able to interpret what was in the mind of

the ancient designer when he planned the most grand, successful, and enduring monument which the world has yet seen.

Look, then, if you please, gentlemen, once more at the Colonel's last photozincograph, or his Plate III. Already I have shown you that, though claiming so to do, it really contains nothing of the mechanical perfections, or actual figure of the socket; but now, I pray you, attend further to the stones forming on the plate the upper corner of the Pyramid. Did you ever see such hideously black, as well as rude and mis-shapen masses, before?

The blackness is, over large parts, as the blackness of soot in that photozincograph which is being published amongst our countrymen as the latest and best reproduction of the Pyramid; yet the material so represented is in very truth of a light and brilliant tint of Naples yellow; blinding bright in sunshine, and, even when in the shade, receiving in that transparent Egyptian atmosphere so large a gift of reflected light, that it is still comparatively bright and luminous to behold, as in fact you may see in many of my photographs again and again. What, then, can Sir Henry James mean by condemning *them* to oblivion and publishing as true his own party's views of stones embued by himself with the darkness and blackness of night?

Some strangers here this evening, not practically versed in the art-science, may possibly imagine that if the photograph did so represent the stones as heaps of darkness that they must have been so in nature: but I beg to correct that popular error.

Insufficient exposure of any photographic plate may give, in the positive copy therefrom, a midnight instead of a noonday effect; and either by ignorance or design one part of a whole subject-scene may have so much less exposure than another as to render that part only in blackness, contrasting therefore egregiously with the other parts which have received full exposure. Hence it is almost as necessary for truthful results that a photographic camera shall be in the hands of men both honest and able, as with the pen of a ready writer: such poor pen being, of itself, just as ready to forge an iniquity as to preach virtue.

With the camera indeed, when properly used, there is a certain innate power of its own to give a reproduction of nature with such an infinity of microscopic detail and accidental circumstance, as to make it equal to thousands and tens of thousands of witnesses: yet it has no capacity to prevent itself being at other times so misused, whether by blundering or craft, as to give to those who are not in the secret a most opposite, or at least a negative, rendering of that which it is stated, or desired to do.

Whether the absolute blackness, then, of these Pyramid stones as given in the Ordnance photozincograph Plate III. is due to the one or the other of these failings in the mind of the military photographers employed (or of their commanding officer, for if *he* gave orders to *mis*-represent the Pyramid, we may be sure that they would be obeyed by all under his command; just as faithfully, indeed, by those splendid soldiers the Royal Engineers have proved themselves to be in a hundred campaigns, as the most heroic orders to storm an enemy's fort in time of war), as to that question I say, we may better delay forming any conclusions until after we have considered the representations of the sad shapes and unmechanical conditions of these so black-faced stones.

The pamphlet does, no doubt, speak of that corner of the Pyramid as "dilapidated;" but then comes the question—Why did the military men choose that scene of modern dilapidation as the only close view of the Pyramid's structure in their pamphlet professedly on the accuracies of that building's original size, and even for the nice purpose of deducing the precise length of the cubit it was anciently built by? *

* The full title of the Ordnance Pamphlet is, *Notes on the Great Pyramid of Egypt and the cubits used in its design*, by Colonel Sir Henry James, R.E., F.R.S., Director-General of the Ordnance Survey, 1869. The first page of the introduction, moreover, contains the following sentences:—"My object in writing these short Notes (the substance of which has already appeared in the columns of the *Athenæum*) has been to obtain a knowledge of the true lengths of the units of measure employed in setting out the external and internal dimensions of this Pyramid; or, in other words, to recover, if possible, the true lengths of the cubits in use upwards of 4,000 years ago. In this investigation the principal point to determine was the exact length of the side of the

Of these modern dilapidations we have heard enough, and far more than enough long, long ago, and indeed from all sorts of travellers to the Great Pyramid during the last 300 years. It is by these dilapidations, for instance, or extensive removals of the whole of the outside, bevelled, smooth and finished surface to a depth of many feet, exposing the edges of the several layers of once internal masonry (*i.e.*, mere filling-up matter, and therefore, for economy, necessarily rude) that a set of *quasi* stairs are formed, by which latter-day idlers get through their stupid task of ascending easily to the top of the structure, and then think, that by conceitedly standing thereon, they have excelled the Pyramid builders and brought the whole primeval structure into modern contempt. And yet all that they really prove by their antics is, that they are as entirely ignorant of what the essence and long-delayed teaching of the structure really consists in, as a cannibal South Sea Islander is of the contents and virtues of a copy of the Holy Scriptures, left with him by a missionary for some far other purpose than either being trodden under foot or helping him to cook his forbidden food.

But amongst all truly scientific men who have yet studied the

square base of the Pyramid, and, having last winter had a party of Royal Engineers from the Ordnance Survey, under Captains W. Wilson and H. S. Palmer, in the peninsula of Sinai, to make a survey of Mount Sinai and the principal points of interest in that peninsula, I directed them on their return through Egypt to carefully measure all four sides of the base, the original extent of which, when the structure was perfect, is preserved by rectangular sockets cut in the solid rock to receive the corner stones. Miss Burdett Coutts, to whom I mentioned my desire to have these measures taken, has, with her wonted liberality in promoting useful enquiries, paid the cost of this work and the cost of measuring the Nilometer at Cairo, in addition to a considerable portion of the cost of the survey of Sinai. Mr. Inglis, a practical engineer, had previously, and for the first time in 1865, measured all the four sides, and his measures *agree well* with those of the Royal Engineers."

I have italicised Sir H. James's words *agree well*, because his next page shows that he thereby refers to a difference of 20 inches on a run of less than 9,200 inches, or a percentage of error that no really scientific man could tolerate for a moment, whatever a military man may choose to do.

Pyramid subject (they are not many, those at least who have ventured to show their faith by public profession), the prevailing questions for several years past have been :—

1. What are the exact measures of the several parts of the ancient Great Pyramid, both internal and external ?

2. Are the real and original fiducial points still existing to measure between ? and

3. Are these fiducial points of a neat, refined, and exact nature ?

Such questions, too, as these, it is absolutely necessary to have answered before safe conclusions can be formed as to the character and intentions of the ancient builders, and even before an appeal can be properly commenced for public aid in applying the most rigorous scientific measurement of modern times to the elucidation of the case.

Is it, in fact, *mechanically worth while* to apply accurate modern measure to the Great Pyramid ? That is the main question just now. And the answer to it can hardly but be, from any one whose only knowledge is derived from the photozincographs and pages of the Ordnance pamphlet, and especially from the plate III., which should be the crucial test for all—"No, it is not worth while ; in fact it would be folly to attempt it, because there is nothing finished, precise, or well defined about the building to which such accurate measure can be applied ; there are only hideously rude, broken, and disjointed stones, as black as Nile mud and shaped like exaggerated pats thereof."

Yet, what is all the while the real fact ?

That if you seek out, as any one in the position of the Ordnance Officers subsidized by Miss Burdett Coutts ought to have done, any still-existing traces of the once outside-finished surface of the Great Pyramid—you find admirably delicate joint-lines, like those well described by Colonel Howard Vyse in his two casing stones *in situ*, and as being scarcely perceptible or not wider than the thickness of silver paper. The workmanship of these stones, too, and of the Pyramid pavement about them, he has declared to be of almost infinite truth and exactness, and that there is every reason

to believe that the whole exterior of the vast structure was covered originally with the same excellent masonry. *

The chief part of what the incomparable Howard Vyse observed, was indeed soon afterwards entirely broken to pieces by mischievous visitors armed with large hammers, before any photographic testimonies became possible: but an approach to the same degree of accuracy of jointing may be remarked in my photographs of the northern end of the entrance passage into the Great Pyramid.

Thus in No. 17. mark, if you please, the greater density and finer constitution of the blocks as you approach the passage-surface. And then on that surface examine the masonry joints in both Nos. 18 and 19. There are some joints there, straight and true as the fiducial modern scales photographed by their sides, and under $\frac{1}{30}$ th of an inch thick, although, too, these joints are mischievously enlarged by modern visitors trying almost daily whether they can or cannot insert the blades of their penknives into any part thereof. But on No. 18 I can, with the assistance of my measures detailed in Vol 2 of *Life and Work*, point you to a place where there is one of the ancient joint-lines, happily not yet discovered by these modern visitors, and therefore so far in its original condition, and behold it is so fine that the photograph has not been able to render it. Yet at that place a line of $\frac{1}{100}$ th of an inch broad would have been perceptible.

* The casing-stones discovered by Colonel Howard Vyse were on so large a scale as to be near four feet high, eight feet broad at the base, and ten feet long; and yet he says of their jointings and worked surfaces, &c.—“The joints were scarcely perceptible, and not wider than the thickness of silver paper; and such is the tenacity of the cement with which they are held together that a fragment of one remained firmly fixed in its original alignment, notwithstanding the lapse of time and the violence to which it had been exposed. The pavement beyond the line of the building was well laid and beautifully finished; but beneath the edifice it was worked with even greater exactness, and to the most perfect level, in order, probably, to obtain a lasting foundation for the magnificent structure to be built upon it. I consider that the workmanship displayed in the King's chamber, in the pavement, and in the casing-stones, is perfectly unrivalled; and that there is no reason to doubt that the whole exterior of this vast structure was covered with the same excellent masonry.”

Or, regard again the sides of the niche in the so-called Queen's Chamber of the Great Pyramid, represented in my photograph No. 22, by aid of magnesium light : see both the grandeur and mathematical beauty of the work—lines true as the 50-inch scales by the side of them, except where modern, and too often educated, men have come with their hammers and broken pieces off.

And thus it fares with the Great Pyramid in the present day. Some men break away remnants of the fine and accurate work that had lived from 4,040 years ago up to their time ; others ignore it, photograph rubbish instead, and imply that that wretched stuff is all the claim to scientific accuracy that the Pyramid possesses.

Now is that the way in which Christian men of the present age would like posterity to treat *their* most precious triumphs of industrial and philosophical art ? To smash them up into a heap, throw rubbish on them, photograph that as comprising or being all the reality, and then say to themselves and the world in complacent tones :—" How low and degraded were not art and science in the year A.D. 1869. How infinitely have not we (say of A.D. 1880) improved on our fathers !"

Of course the chief scientists of our own period—who are so frequently attacking each other for a few days or even hours of priority in some single little item of discovery—would not at all like the full and finished work of their whole scientific lives to be carelessly consigned to such total oblivion. Wherefore, if they love justice, and if they have profited in any way by the Divine teaching of 1840 years ago, why should they not so act in the future that posterity shall have no occasion to brand them in history as having refused to study with ability or discuss with impartiality or even hear of with patience the greatest, best, and most enduring of all the works of primeval times ; and not only so, but for having even sent men positively to annihilate its long preserved accuracies, and then persistently to degrade its character before their own generation—a poor mode of obtaining a triumph of, after all, only an illusory and ephemeral nature.

Such, Mr. Chairman, is the unflinching style of testimony of not a few of the *poor* man's long previous photographs against the overweening, but scant and faulty, photography of the recent pamphlet by the rich and powerful Pyramid coalition in the south. Against other parts of that publication worse faults still have been established elsewhere, and more are to come.

What, then, can possibly be the advantage—at least to all men's exact knowledge of the Great Pyramid—that the said *poor* man's work should be covered with obloquy and consigned to oblivion, in order that its place may henceforth be occupied by the coalition's pamphlet, and this be sent about the country in covers “On Her Majesty's Service?” Who, too, are the members of Her Majesty's Government who are implicated in this transaction and all that it implies?

These questions are, however, so far too deep, or of so unusual a nature in science, for me, that I must fain leave them in the hands of the public to solve in their own established manner; but I cannot conclude without giving my best thanks both to the President and the meeting for having had the kindness to listen to me thus long and patiently. Nor should I forget to testify my acknowledgments to the several members of your working committee, as to Mr. Davies, the Secretary, and to Messrs. Nicol and Slight, for their unwearied services these two last days in preparing all the illuminating methods by which my photographs, such as they are, have now been exhibited before you.

C. PIAZZI SMYTH.



APPENDICES.

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APPENDIX.—I.

List of positive transparencies upon glass, prepared by the author from his negatives taken in Egypt in 1865, and exhibited on this occasion at the Edinburgh Photographic Society.

CHARACTER OR SIZE.

- 1 to 12, on glasses 6·75 by 3·25 inches.
- 13 to 32, on glasses 10 by 8 inches.
- 33 to 38, on glasses 7·75 by 4·25 inches.
- 39 to 50, stereoscopic, each component of every pair of pictures being 2·7 inches broad by 3·25 inches high.

SUBJECTS.

1. The Valley of Egypt and the Mokattam Hills, from the Great Pyramid hill.
2. The Jeezeh Pyramids, from the hill of petrified shells.
3. A portion of the foreground of the above view highly magnified to show the shells more clearly.
4. The Great Pyramid, and the causeway from the plain on the east.
5. The Great Pyramid and the Second Pyramid, from the plain on the north-east.
6. The Artificial Esplanade on the north front of the Great Pyramid, overlooked from Desert Hills to the north-west.
7. The rubbish heap—a difficulty to base-side measurers—on the west side of the Great Pyramid, the heap being at its culminating point 600 inches high.
8. The Core Masonry at the north-east angle of the Great Pyramid.
9. Colonel Howard Vyse's hole on the south side of the Great Pyramid, and the southern rubbish heap, 680 inches high.
10. The Mark of an Egyptian visitor of the Theban Empire on the rock enclosure of the Second Pyramid.
11. What the entrance passage of King Shafre's tomb really points to; being a refutation of an assertion by M. Renan, in the *Revue des Deux Mondes* for April, 1865.
12. The last man, after an exciting day at the Great Pyramid.

13. The Great Pyramid, with an answer to Strabo's question as to what the builders did with the chips of all their worked stones.

14. The casing-stone remnant near the summit of the Second Pyramid: this was in part copied as a diagram frontispiece to Vol. 3 of *Life and Work at the Great Pyramid* published in 1867.

15. The modern rubbish mounds on the north side of the Great Pyramid, also offering difficulty to base-side measurers.

16. The entrance into Great Pyramid and Caliph Al Mamoon's hole.

17. The inclined courses of masonry connected with the entrance-passage of the Great Pyramid.

18. Beginning of the entrance-passage of the Great Pyramid, showing some of the fine and true joints of the masonry, together with much modern barbarity.

19. The dark entrance into the Great Pyramid viewed on its own plane, which is really inclined $26^{\circ} 27'$ to the vertical.

20. The first picture taken inside the Great Pyramid, by magnesium light, in the King's Chamber.

21. The broken corner of the coffer in the King's Chamber, by magnesium light.

22. Base of the niche in the Queen's Chamber of the Great Pyramid, by magnesium light.

23. The well-chamber in King Shafre's tomb, at the instant of noon, computed from astronomical observation.

24. Alee Dobree in front of one of the tombs on the eastern side of the Great Pyramid hill.

25. The south-west foot of the Great Pyramid, and the ground in front of it, *before* the sockets were opened by Messrs. Aiton, Inglis, &c., in 1865.

26. The same south-west foot of the Great Pyramid *after* the socket had been discovered and excavated.

27. The north-east foot of the Great Pyramid, and the ground in front of it, *before* the socket was uncovered or excavated in 1865.

28. The same north-east foot of the Great Pyramid *after* the socket had been excavated.

29. The north-east socket of the Great Pyramid after excavation.

30. The north-west socket of the Great Pyramid after excavation.

31. The south-east socket of the Great Pyramid after excavation.

32. The outer end of the ancient east-north-east azimuth trench on the eastern side of the Great Pyramid, measuring 150 inches deep.

33. The Great Pyramid from the plains on the north.

34. The Great Pyramid, with the Sphinx shown in its relative insignificance and disconnection, as seen in bird's-eye view from the summit of the hill near the southern causeway.

35. The Great Pyramid and the east tombs' cliff, as seen from the eastern plains.

36. All the Jeezeh Pyramids, as seen from the south-west.

37. The masonry courses of the Great Pyramid at its south-western angle, illustrating the insertion of certain extra thick courses between the 25th and 50th from the pavement upwards.

38. Exterior of the entrance passage of King Shafre's tomb, of which the interior was shown in photograph No. 11.

39. The east tombs' cliff on the eastern side of Pyramid hill.

40. Allee Dobree at east tombs.

41. A lately-harried tomb of bared bones at east tombs.

42. Lamentable smashings of tombs on Pyramid hill.

43. Top of Great Pyramid from the east-north-east azimuth trench.

44. The outward end of the east-north-east azimuth trench.

45. The north-east socket and north-east foot of the Great Pyramid.

46. The north-east socket of the Great Pyramid.

47. The north-west socket of the Great Pyramid.

48. The south-east socket of the Great Pyramid.

49. The coffer in the King's Chamber of the Great Pyramid, by magnesium light.

50. The broken corner of the coffer, in the King's Chamber of the Great Pyramid, by magnesium light.

APPENDIX II.

THE "EDINBURGH DAILY REVIEW" ADVOCATES SIR HENRY JAMES'S
AGGRESSIVE PAMPHLET.

In an editorial article of the *Edinburgh Daily Review*, dated September 6, 1869 (but at a period of rather promiscuous efforts to hold the official pen, or during the *interregnum* which necessarily in-

tervened between the lamented death of the late and long-respected editor and the appointment of his present very literary and gentlemanly successor), there appeared a notice commencing as follows :—

“ THE GREAT PYRAMID.

“ Sir Henry James, the distinguished Director-General of the Ordnance Survey, and one of the greatest living authorities upon any question of measurement, has just published the results of some observations lately made upon the Great Pyramid of Jizeh. As these may prove interesting to many of our readers who take an interest in that wonderful structure, we embody, with the few remarks that follow, some extracts from Sir Henry's work :”—

The remarks alluded to above, were then made to set forth in a neatly plausible manner, and with deceptive skill for the multitude, that whereas, in any metrological theory of the Great Pyramid it must evidently be of vital consequence to ascertain beforehand by actual measurement what is the real length of the side of the base of the monument, yet both the late John Taylor and the existing Piazzi Smyth had rashly formed such a theory without attempting to refer to any measure of the all-important base-side length ; and that, in fact, they had invented a length specially to suit their own theory. But, most fortunately for science, Colonel Sir Henry James having sent a party of Royal Engineers from the Ordnance Survey to Egypt last winter, had been able by their means to procure a measure of that much needed quantity, *viz.*, the true length of the base-side of the Great Pyramid : and he had therefrom succeeded in deducing such different conclusions as to the objects of the ancient building as totally to upset Professor Smyth's published ideas ; and even to justify Sir Henry James in glorifying grossly over them in the following long paragraph, which the acting editor kindly extracted in full, and set forth for the indoctrination or misleading of his Edinburgh audience, thus :—

“ The Director-General adds :—‘ The solution of practical questions of this kind is most useful for young people,* and tends to prevent

* The “ young people ” here alluded to refers to the school children of the Colonel's previous paragraph, which runs as follows :—“ The diagrams are unnecessary for any one who possesses a knowledge of mathematics, but I have inserted them because I have been desirous of putting the

' their being carried away by such crotchets about numbers as that,
 ' because the number of feet in a degree of longitude at the equator is
 ' 365,234 feet (see Geodetic Tables of Ordnance Survey), therefore there
 ' are as many thousands of feet in a degree of longitude at the equator
 ' as there are days in the year, viz., 365,242, and consequently that our
 ' English foot is an earth and a year commensurate unit; and that as,
 ' when our English foot was first used by our Pagan ancestors, no one
 ' knew the dimensions of the earth or the true length of the year,
 ' therefore, the length of an English foot must have been given us
 ' directly from the hand of God! This may be taken as a type, but a
 ' far too favourable one, of the extravagant nonsense to be found in
 ' modern works on the Great Pyramid. It is too favourable because
 ' the numbers given are accurate and nearly exact in their agreement,
 ' which they are not in the works of the authors referred to. To make
 ' the above a more perfect type of the absurd theories contained in
 ' these works we should add, that as our English foot has been proved
 ' to be of Divine origin, it is a standard by which the religious belief
 ' of other nations may be guaged, for those nations whose standards
 ' of length differ most from our twelve inches are the farthest from
 ' heaven, and may the Lord have pity on the souls of those who would
 ' introduce that utter abomination the metre of 39.371 inches! The
 ' rising generation should have their minds so trained and educated
 ' that they could not be misled by such like absurdities as these.
 ' The quaint notion formerly maintained that the Pyramids were
 ' crystalline excrescences, formed by the action of the sun upon the
 ' mud of the valley of the Nile, was sound philosophy compared with
 ' the notions which have been recently advanced respecting them.' "

So far Colonel Sir Henry James, R.E., and his closely-following
 admirer, the unknown and temporarily acting editor of the *Daily*
Review on September 6, 1869; and the answer to them may be
 commenced in this manner:—

That the number of feet in an equatorial degree had been duly con-
 sidered both by myself and other Pyramid friends long before Sir
 Henry James took it up in this manner, and that our views upon it
 were of a totally different and absolutely opposite character to those
 which the powerful Director-General of the Ordnance Survey has so

' simple geometrical problem involved in this question in the clearest
 ' possible light, and in the hope that these *Notes* will be found useful
 ' for the instruction of the boys in our National and other schools."

contemptuously described, any impartial reader may convince himself by perusing an excellent paper by Mr. William Petrie *On Probabilities of Coincidence*, at p. 453 of my volume on *The Antiquity of Intellectual Man*, published in 1868. But with regard to the rest of the torrent of abuse, if not true, recoiling on its author's own head, I shall proceed to show, in Appendix III., that what the whole of it mainly founds on, viz., a supposed good and faithful measure of the length of the Great Pyramid's base-side by Colonel Sir Henry James or his men, and by no one else, is partly a series of blunders and partly a tissue of most inexcusable falsifications.

APPENDIX III.

Professor PIAZZI SMYTH, to the Editor of the *Daily Review*, Edinburgh, 21st September, 1869.

SIR,—In your issue of the 6th inst., under the head of "The Great Pyramid of Egypt," you have given a very honourable and prominent position to a notice of a recent publication on that building by Col. Sir Henry James of the Royal Engineers, Director-General of the Ordnance Survey; and as you have not only introduced my name, although it does not actually appear in the Colonel's pamphlet, into your notice, but have then and there quoted largely, and applied directly to my writings, several of the Colonel's most maledictory general assertions and loud denunciations as to what he calls even unheard-of absurdities and pernicious mischief to the rising generation—you have evidently rendered it incumbent on me to state, whether I accept such round and strongly-spiced phrases of mere rhetorical abuse as a true demonstration of the total error of opinions which I have long held, and still continue to hold, with, as it appears to me, an increasing amount of consentaneous circumstances and measurable data both of scientific support and physical proof.

THE FIRST, THOUGH UNACKNOWLEDGED, RESULT OF THE ROYAL
ENGINEERS' MEASURE AT THE GREAT PYRAMID, IS AGAINST
SIR HENRY JAMES.

The one and only new instrumental observation, of all the many

that might have been made, which the Colonel's pamphlet records, and was published very notably to record, is the mean length of a side of the Great Pyramid's base from socket to socket. This length he states, without giving working particulars, at 9,130 inches; and such being the result of an expedition composed of military men approved by H.M. Government, ordered by Sir Henry James, and paid for by a wealthy and well-meaning private lady in London, its obtained numbers and their consequences ought in honesty and officiality to be compared with the grounds which were previously put forward by its promoters to justify both so unusual an undertaking and the removal of many officers and men from their proper work on the Ordnance Survey of Great Britain, a survey already far behind the time of its long expected completion. Now, these grounds, though not mentioned in the pamphlet, were stated by Sir Henry James in the *Athenæum* for November 28, 1868, to be almost purely and entirely his own discovery (on paper), that the measures of all former explorers at the Great Pyramid were shamefully inaccurate, and laboured under so huge a discordance as nearly 16 feet: the Astronomer Royal of Scotland, being directly mentioned as one of those who were so flagitiously in error!

What, then, has been the result of the new measure, applied by no friendly hand, under the auspices of this remarkable paper discovery at Southampton?

Why, to bring out the number of 9,130 inches; which comes between the greater and less of the several results of other observers as already published by me,* and abundantly within the limits which I had de-

* In Volume III. of *Life and Work at the Great Pyramid*, pages 124 to 127, I have given all the authorities that I was then acquainted with for a socket to socket measure of the Great Pyramid's base-side, thus:—

| | Brit. inches. |
|--|---------------|
| North side, by Col. Howard Vyse, in 1837 | = 9168 |
| „ French Academicians in 1799 | = 9163 |
| „ Mahmoud Bey in 1862..... | = 9162 |
| „ Aiton and Inglis in 1865 | = 9120 |
| South side „ | = 9114 |
| East side „ | = 9162 |
| West side „ | = 9102 |

I was much puzzled how to derive from these numbers a final expression for the mean base-side, as I presume any one else would be too; but when I finally decided, according to principles also detailed in those pages, on 9142

duced from all the best authorities as being those of the *true* length; and I had published them in the Proceedings of the Royal Society of Edinburgh for April, 1868, and elsewhere, thus :—9,142 British inches, within the limits, *more or less*, of 25 of the same inches.

Here, therefore, in a difference from the new measure of only 12 inches, may be claimed a total disproof of the alleged atrocious discordance of 16 feet, as so much insisted on beforehand by Sir Henry James; who now, indeed, instead of having succeeded in blowing up all his predecessors ignominiously, and showing that they were nearly 200 inches from the truth, rather stands in the light of that engineer who was “hoist by *his own* petard.”

THE SECOND RESULT IS TO PROVE THE ESSENTIAL BADNESS OF THE
ROYAL ENGINEER MEASURE, IN A SCIENTIFIC POINT OF VIEW.

The new base-side measure resulting in 9,130 inches by his own Royal Engineers is indeed quite good enough to do that confounding service for the gallant Director-General and his 16 feet of error; but is it also sufficiently exact to satisfy the higher requirements of the modern theory of the Great Pyramid where an exactness of the $\frac{1}{1000}$ th of a foot is looked for? By no means, I regret to have to reply, for it is merely another imperfect, approximate, or, shortly to speak, *bad* measure added on to the many other similar ones already in the field; and if you inquire how I venture to speak thus of a deter-

inches—it is evident that the Royal Engineers' measure of 1869, amounting to 9130 inches, may be taken as rather confirmatory, than otherwise, of my concluded result, coming as it does in the vacant space between the group of large results on one side, and small ones on the other.

There is, indeed, another measure still of the north side of the Great Pyramid's base, and by so celebrated an Egyptologist as Sir Gardner Wilkinson. It *purports* to be from socket to socket, and makes that distance 9072 inches only, as given in Murray's *Handbook to Egypt* for 1858, at p. 172. The accounts, however, related to me in Cairo by one of Sir Gardner's contemporaries, led me to doubt whether the real north-west socket had been seen upon the occasion; while Sir Gardner's own words in Murray, touching a lower tier of the Great Pyramid having possibly been of *granite*, are so strangely without any support from any Great Pyramid testimony, either by himself or any one else, and so suicidally antagonistic to Colonel Howard Vyse's well attested casing-stones of the lowest tier of Mokattam stone *in situ*—that I have thought it safest for the character of Sir Gardner Wilkinson, as well as for due understanding of the Pyramid, to leave out his very doubtful result from the list of accepted and acknowledged socket-measures.

mination which "one of the greatest living authorities upon any question of measurement" thinks so highly of as to have built the castle of his aggressive pamphlet thereupon, I answer, with reference to what I published, both in special writings and in the papers of the Royal Society of Edinburgh, long before the military expedition to the Great Pyramid was even imagined, thus :—

1. The desiderated measure requires to be made upon *both* the corner sockets, *and* the casing stones *in situ* in the middle of the base-sides and resting on the ancient "pavement" of the Pyramid, the former by themselves not being fully interpretable. Yet those imperfect corner sockets were the only supposed fiducial traces attended to or seen by the Royal Engineers, whose measure is therefore deficient in some of the most important marks and things to be measured upon.

2. The Royal Engineers' measure, between such points as they *did* attend to, was not made with anything approaching to first-class accuracy of mensuration, even according to Sir Henry James himself; for he, in his subsequent discussion, lops off a whole 10 inches from their result without compunction; whereas it ought to have been measured to such precision that not a hundredth of an inch could have been questioned, much less removed with impunity; and in my very first publication on the Great Pyramid I referred, as a proper ideal of accuracy in its base-side measures to the astronomer, Sir T. Maclear's measure of a base line in South Africa, accurate to within a quarter of an inch upon a run of eight miles, or equivalent to an uncertainty of only five-thousandths of an inch on the much smaller length of the Great Pyramid base-side.

3. The Royal Engineers' measure has been most improperly (if not deceitfully) altered in the pamphlet from 9130 to 9120 inches; for, while Sir Henry James keeps out of view *in this pamphlet* that there is any other socket measure of the base (which he assumes to be square) than a certain one which yields 9110 inches for the mean side, there are two better and more careful measures of one of the sides of the said base, allowedly square, yielding the one 9163 and the other 9168 inches; and these are not only known to him (Sir Henry James), but the latter of them was quoted and adopted by him in the *Athenæum*, under date November 16th, 1867, as the one and only true measure of the Great Pyramid's base-side, when, for a totally different hypothesis to that which he is now maintaining, he *wanted* a different number.

MEASURES OF LENGTH TAMPERED WITH, AND MEASURES OF ANGLE
MIS-STATED.

Twice, then, has Sir Henry James cooked the published results of Great Pyramid base-side measure. Firstly, when, to satisfy one of his hypothetical fancies, he published 9168 inches as the only worthy known measure, and kept out of view the 9110 inches—though it was duly mentioned in the book (*viz.*, my *Life and Work at the Great Pyramid*), which he was then criticising; and secondly, when, in little more than a year afterwards, to make another equally untenable and anachronical hypothesis *look* probable, he published the 9110 and kept back the 9168, as well as the 9163 of our scientific neighbours, the French Academicians, and which result was to be found in the same place wherefrom he had successively and variously drawn the other two numbers.

Hence it is quite futile to discuss any important question about the measures or history of the Great Pyramid upon the statements of Colonel Sir Henry James alone and unchecked. When, therefore, he sets forth upon p. 13 of the pamphlet which you have recommended to your readers, that “from the measures of Colonel Vyse and Mr. Perring it is evident that the Second and Third Pyramid had the same proportions as the First or Great Pyramid,” I shall not trouble myself to declare that he thereby says as much as that black is white and white black, and by that mere assertion would seek to destroy one of the most precious evidences in the scientific theory of the Great Pyramid; nor shall I refer to my own published measures of the real and tested differences between the angles, which rule or constitute their proportions in the Great and the Second Pyramids both in their whole bulk and in each fragment of individual casing stones obtained—but I will simply quote Colonel Howard Vyse’s “Pyramids of Gizeh,” vol. ii., pp. 109-120, where he condenses the results of his own and Mr. Perring’s measures, and where the following numbers may be read—Sir Henry James’s assertion to the contrary nevertheless:—

| | |
|-----------------------------------|----------|
| “Angle of the Great Pyramid | 51° 50’ |
| Angle of the Second Pyramid | 52° 20’ |
| Angle of the Third Pyramid | 51° 0’ ” |

i.e., implying a difference almost in degrees than minutes or seconds only, although some other of the Jeezeh Pyramids come, according to Vyse, so near together in their angles of slope as thus:—

| | |
|-----------------------------------|-----------|
| "Angle of the Fifth Pyramid | 52° 15' |
| Angle of the Seventh Pyramid..... | 52° 10' |
| Angle of the Eighth Pyramid | 52° 10' |
| Angle of the Ninth Pyramid..... | 52° 10' " |

proving that the builders could keep close to a minute of angle if they tried. And when it is also remembered that a difference of three minutes from the Great Pyramid's mean concluded angle of $51^{\circ} 51' 14''$ has been held to overthrow the claim of any theory with such difference to represent the Great Pyramid's shape and the intention of its architects, *i.e.*, that pyramids of either $51^{\circ} 48'$ on one hand, or $51^{\circ} 54'$ on the other, have been accepted as actually different shapes from one of $51^{\circ} 51'$; much more must we so treat Pyramids of $51^{\circ} 0'$ and $52^{\circ} 20'$ especially in the present advanced state both of Pyramidology and general science.

As well, indeed, might we refuse to allow that there are any differences in the latitudes and longitudes of all European observatories, or amongst all the books that have ever been written on astronomy, or deny that 7 or 10 can be distinguished from 8, in arithmetic—as refuse to acknowledge that the Great Pyramid was built to an actually different angle, as it was also built with an actually different size from the other pyramids, not only of Jeezeh, but of all Egypt.

UNTRUE STATEMENT TOUCHING THE CONDITION OF THE SOCKETS IN FORMER TIMES.

Not content, however, with mis-stating the results of former explorers at the place, Sir Henry James, in his easy chair at Southampton, and revelling in the pleasure of having got the costs of his surveying party paid by a rich lady in London, flings degrading animadversions at those who bore the toil and expense of many a weary day, on their own account, at the Pyramid, in the following, among other sentences:—"Considering the number of people who "have undertaken to measure this Pyramid, it is very remarkable that "no one had measured all the four sides before Mr. Inglis did, and "more especially because the positions of the sockets were known to "within a foot or two, and they were only covered by a little sand, "easily removable by the hand; and nothing could be more simple "to any practical engineer than to measure the distances between the "corners."

Yet how could these things, the positions of the sockets, be known to "*within a foot or two*" before any modern man had seen or knew

positively even of the existence of, two at least, out of the presently known four, sockets; and there is no breath of a proof that they had been all uncovered in modern times before those efforts of Messrs. Aiton and Inglis, at which I assisted; or that all four had been described by any one in print, until I gave full particulars, partly by my own measures and partly by those of Messrs. Aiton and Inglis communicated to me for the purpose, in my book *Life and Work*.

Previously to that, the length of the ancient base side must have been at least *one* of the elements required to be known by any searcher when commencing the search, and we have already seen that "the distinguished Director-General of the Ordnance Survey, and one of the greatest living authorities upon any question of measurement," was himself in error upon that one point, only last November, to the extent of some *sixteen* feet.

While, as to his positive statement that the sockets "were only covered with a little sand, easily removable by the hand," I have in my possession photographs taken by myself during or immediately after the uncovering by Messrs. Aiton and Inglis with their Arab workmen, showing that the material then cut through to uncover the said sockets was mostly a hard, stony rubbish, or rude, natural, semi-concrete; and the depth so considerable as to amount over all four sockets to an excavation of several hundred cubic feet. The material, therefore, so hard, the quantity so great, and the site so uncertain with no visible markings on the ground to within a dozen feet or more, to indicate whereabouts to dig, that were the public—before whom I hope soon to exhibit some enlarged copies of these photographs on glass—were the public, I say, to condemn Sir Henry James to perform a similar work to that which he states could have been done *so easily*, he would have to grovel in the earth all the rest of his days, and his two hands would be worn down to the bone, unless indeed the integument with which they are covered is of a remarkably pachydermatous order.

RIDICULE ATTEMPTED TO BE THROWN ON TRUE SCIENTIFIC DEDUCTIONS.

From undervaluing recent explorers at the Great Pyramid, it is but a step for the same man—still sitting at home and not caring to see with his eyes the wonders he is writing of—to do the same unhand-some thing for the Primeval Monument's ancient builders and their purposes; wherefore, although such a world-acknowledged philoso-

pler as Sir John Herschel, from the angular position of the entrance passage had deduced the admirable conclusion of its chronological purpose in connection with Alpha Draconis, the Polar star of the early world (a conclusion, too, since confirmed abundantly by further exploration and by pure astronomy), Col. Sir Henry James writes thus of the same feature in terms of studied contempt, and in complete forgetfulness of that part of it which includes careful astronomical orientation on the horizontal, as well as in the vertical, plane :—

“If any schoolboy will tilt up a fire-brick 4 inches, in the way he would for catching sparrows, the upper surface of the brick will then have the inclination of the passages into the Pyramid.”

Thus, also, he writes of some of the recent confirmations bearing on Sir John Herschel's elevated views, calling them “absurd theories,” “the extravagant nonsense to be found in modern works on the Great Pyramid,” with many other similar flowers of speech.

THE SAME TREATMENT ATTEMPTED ON RELIGIOUS DEDUCTIONS.

But far more serious is it when the “Director-General of the Ordnance Survey” proceeds to ridicule the *religious* deductions of those who have recently written on the Great Pyramid; for when he indites what he *says* is a parallel case, in order to render it ridiculous and easily knock it over, and entirely leaves out all allusion to the one and essential feature or claim of the Pyramid theory to be looked on as appertaining to sacred things, viz., its support from the revealed Word of God, he either shows that he knows nothing of what the religion of Revelation is, or commits a deadly sin. Yet the progress of the scientific theory of the Great Pyramid, which has insensibly merged into the religious, has been of late so decided that there is at least *one* of its crucial points which not even Sir Henry James has been able to gainsay or resist; *quietly*, therefore, has he adopted it, or at least nineteen-twentieths of it, in certain cubit notations on his last plate-page or Plate V., without explanation or amend.

RE-STATEMENT OF A PORTION OF THE RELIGIOUS ARGUMENT.

I will conclude, therefore, with a short account of what he *ought* to have stated on the occasion. The scientific and sacred theory of the Great Pyramid, as begun by the late John Taylor and continued by myself and others, always included, as an essential and characterising feature and fact, an idea originally started by Sir Isaac Newton and since confirmed, that the length of the cubit of the profane nations,

such as Egypt, Babylon, and Phœnicia was one thing, and the length of the cubit of the Hebrews, as used by them for their sacred purposes, or the cubit alluded to in the Bible as that in terms of which the sizes of certain structures were, according to the Bible, given by that incomparably grand and mysterious though all-important thing to humanity, inspiration from God, was a totally different one. The former, in fact, was about 20·7 inches, within a few hundredths of an inch, and the latter was 25 inches as nearly.

Now, this view was so directly opposed by Col. Sir Henry James, or the Palestine Exploration Association, or both, that in one of their maps of Jerusalem, published by the Ordnance Survey Office about 1865-6, they have utterly confounded the sacred and profane measures; and to one of their scales in cubits of the universally recognised Pagan length—that is, between 20·6 and 20·7 inches—they have actually dared to affix the amazing title, *Egyptian, Hebrew, Babylonian; Royal or Sacred cubits, also named cubits of the Tabernacle!* A more decided case than this of declaring their colours could not be if it was done intentionally, whether by copying from writers of acknowledged infidel sentiments, or otherwise. I pleaded against it in my various Pyramid publications, but apparently in vain until now, when, on the last plate (Plate V., and amongst the measures attached to the Cairo Nilometer), in the new pamphlet by the Director-General of the Ordnance Survey, behold, without any retraction of, or apology for, that former sad confounding, on the very map of *Jerusalem* itself, of things as essentially different as Cain and Abel—yea, even Antichrist and Christ, and without any acknowledgment of whence the correction has been derived—behold, side by side, though now decently separated, “the cubit of Memphis,” or profane cubit of Egypt, depicted as equal to “20·699” British inches, and “the Sacred cubit” made much greater, or equal to no less than “24·84,” of the same inches.

What, then, will the Palestine Exploration gentlemen do now with their unfortunate map of Jerusalem, when their Director-General has deserted the position he formerly established them in; and has, after enveloping himself in a cloud of abusive vituperation against, instead of thanks towards, those who have shown him the weakness of his first position in the matter of cubits, come over almost entirely to this vital point of the sacred and scientific theory of the Great Pyramid, viz., the sacred cubit of God’s inspired Book being so much longer than the profane cubit of Egypt, and by such a peculiar quantity, as to promise to be thereby an evenly commensurable fraction of the earth’s

length of polar axis ; or the most scientific as well as suitable standard of measure to all the nations of the earth that ever has been, or ever can be, devised so long as the earth and man remain and the present dispensation may last ?

Biblical scholars and clergymen in general have been far too prone to cry out depreciatingly, when questioned as to precise particulars which they could not understand touching either the chronology or metrology of the Bible, "It is naught, it is naught ;" and have persistently undervalued the part which the Great Pyramid has begun to serve in recent years in throwing a new and clearer light on those very things ; but if these same particulars are an integral portion of the revealed and inspired Scriptures of God, can it be anything in the end than confusion of face to both readers and preachers of the Book, in the midst of a people falling away from their ancient Churches, if they continue to set aside these constituent parts of the sacred whole, or refuse to attend to certain *material* aids which the Author of all may have appointed from the beginning, to assist in making His *written* message more fully understood as time expires, and the end comes on?—I am, &c.

C. PIAZZI SMYTH.

1, Hillside Crescent, Edinburgh,
21st September, 1869.

APPENDIX IV.

Colonel Sir HENRY JAMES, R.E., Director-General of the Ordnance Survey, to the Editor of the *Daily Review*, Edinburgh, 9th October, 1869.

SIR,—I have been travelling in the Hebrides, and have not yet had an opportunity of reading the notice of my *Notes on the Great Pyramid*, which, from the remarks of Professor Piazza Smyth (reprinted from the *Daily Review* of September the 23rd), I learn appeared in your issue of the 6th September. I yesterday received a copy of those remarks, with a note from Sir John Herschel, of the 30th September, in which he says—"The inclination of the passages I used to think quite satisfactorily accounted for by being able to see *Alpha Draconis* through them ; now you have shown a practical and assuredly very

natural reason in pointing out 26° as the 'angle of rest,' facilitating the sliding down of great weights without incurring a '*down-rush*,' and directly subserving the intention of blocking up the access to the burial chamber." The Professor must note this in any future reference to the opinions of Sir John Herschel; and when he refers to the geoditic labours of Sir Thomas Maclean, Astronomer-Royal at the Cape of Good Hope, he may state what his opinion is of my method of determining the length of the Egyptian cubit. He says:—"The relation between the Greek foot and (Egyptian) cubit is exactly what I often longed for," and "your application of the Greek cubit to the lengths between the sockets of the Great Pyramid (measured by Mr. Inglis) furnishes a singularly happy determination."

At page 8 of my notes I stated that the British foot was to the Egyptian or Greek foot as 75 to 76, or as 1 to 1.01333. From a note I have received from Mr. Penrose, who measured the Hecatompedon, I learn that he makes the ratio as 1 to 1.01336. "This modification" (made in consequence of the recomparison of his rods by the Messrs. Simms after his return from Athens), he says, "does not in any degree alter the argument you adduced from them; indeed, it tends towards a still nearer agreement with the Pyramid measures."

Professor Smyth should quote the high authority on which the values of the scales on the maps of Jerusalem were given. It is very plainly engraved on the maps, and it is disingenuous not to do so. If I had not since investigated the values of the ancient measures, and corrected those I found wrong, I should have neglected my duty.

The angles of the inclinations of the faces of the first, second, and third pyramids, which are quoted by Professor Smyth, sufficiently establish the fact that these three pyramids had the same proportions; but there are people who "cannot see the forest for the trees," and who would measure the height and girth of every single tree to find the area of the forest.

I have carefully read over the last page of my Notes, and am utterly at a loss to imagine what the Professor finds in it to lead him to the conclusion that I have adopted nineteen-twentieths of what he calls the "sacred theory" of the pyramid. Don Quixote might have been right when he maintained that the barber's basin was the helmet of Mambrino, and that when he wore it it was a measure of capacity; but I protest against its being supposed that I accept the smallest fraction of a theory which would make the coffin of King Cheops a sacred measure of capacity. I would rather undertake to prove that the

hoops upon an old whisky cask represented the orbits of the planets, and that the dark profundity seen through the bung-hole was the limbo to which the spirits of unbelievers in this sacred theory would be consigned, than undertake to prove that the Egyptian pagans were working under the inspiration of God when "this sacred pyramid was supernaturally devised," and that a knowledge of this fact has been communicated to the learned Professor in, as he says, "Yea, even a revelation." It is sheer nonsense in a comically solemn dress.—I am,
&c.,

HENRY JAMES,

Colonel of the Royal Engineers.

Knoydart, Inverness-shire,
9th October, 1869.

APPENDIX V.

Professor PIAZZI SMYTH, to the Editor of the *Daily Review*, Edinburgh,
22nd October, 1869.

Sir,—In your issue of last Monday, you have printed a letter from Colonel Sir Henry James, Director-General of the Ordnance Survey, on the Great Pyramid and myself, but couched in *such* language, even when touching on religious beliefs, that I rather doubt the propriety of continuing the correspondence in your columns. Nor am I really compelled so to do, as my friend, St. John Vincent Day, civil engineer, is about to publish a pamphlet, dealing with the Colonel's theories and methods far more completely than is possible for me within the limits of a newspaper letter. Yet, inasmuch as Sir Henry James's last communication to the public is resonant of certain great names, as though they supported him in the very subjects where I had exhibited his radical errors in your paper of the 26th ult., and which I still adhere to in every particular so far as discussed, there are some of your readers who may desire to know what the weight or applicability of the Colonel's new supply of nominal testimony may really be.

SIR THOMAS MACLEAR.

Sir Thomas Maclear's is one of the celebrated names thus brought forward. I had mentioned that energetic astronomer as an ideal of accuracy in base-line measures, his final error on one such work, over

a distance of eight miles, having amounted to no more than the two-millionth part of the whole; whereas the error of Sir Henry James's delegated work at the Pyramid, on a run of less than two-thirds of a mile, was so gross, according to his own arbitrary correction of it, as to have reached the extravagantly large fraction of a *nine hundred and thirteenth* part of the whole. Does, then, the extract which Sir Henry James gives from a letter of Sir Thomas Maclear palliate in any way Sir Henry James's large proportional error in his Pyramid base-line mensuration? Not in the slightest degree; it refers, on the contrary, to a totally different matter, or to a semi-theoretical fancy touching the possible equality of the ancient Egyptian and long subsequent Grecian cubits; and, on the strength of Sir Henry James *saying* that he has proved it, compliments him thereupon. But had Sir Thomas Maclear known how monstrously large were the errors in Sir Henry James's recent base-side work, and on which he is trying to make the proof stand up, the good South African astronomer might possibly, with regard to such a *wide* observation of the radical thing really wanted, have addressed him, Director-General of the Ordnance Survey though he be, in those noted words of Cromwell, when the countryman who had fired at him from behind a churchyard wall was brought before his stern, inscrutable gaze—"You've missed your mark; and what a mark! Had one of MY men made such a miss, I'd have hung him to the nearest tree."

MR. PENROSE.

Next the name of Mr. Penrose is introduced by Sir Henry James as having given to him lately an improved determination of the Greek foot, and thence the cubit. But I had said nothing either for or against Mr. Penrose's numbers in that matter, and neither their accuracy nor inaccuracy can touch in any way the real case which I dwelt upon, and which was this, viz., that Sir Henry James, having got from somewhere or other some numbers for the Greek foot or cubit, proceeded to tamper with or "cook" the Pyramid measures, to *make* them agree therewith; and, further, that he had performed that discreditable operation twice over, in a curiously complete manner, to his own confusion. *First*, for instance, he had declared in November, 1867, that the builder of the Great Pyramid had designed its base-side length to measure 360 lengths of a cubit 25·488 inches long; but *since* then he has turned round utterly, and says that the design was for 500 lengths of a cubit 18·24 inches long. Now, the former length

amounts to 9175·68 inches, while the latter only reaches 9120 inches; and the sole proof of the ancient builder's *intention* in either case is the very weak affair of a single possible coincidence with actual modern measure. But that coincidence, Sir Henry James said on each occasion, was *exact*, and to prove it so, he first—under the mistake that $360 \times 25\cdot488 = 9168$ —exhibited only Colonel Howard Vyse's measure of the Pyramid base-side, or 9168 inches, and *kept out of view* the measure of Messrs Aiton and Inglis, published by me, and $= 9110$ inches. But on the second occasion, or to establish his second hypothesis, Sir Henry James brought out with honour precisely that 9110 inch result which he had formerly concealed, and now he just as completely hid the very 9168 inch measure which he had formerly vaunted; and then, by combining such solitary 9110 result with his own, or his men's, 9130, he obtained his latterly much-coveted quantity of 9120 inches, and exhibited it virtually as the one and only true and sure result of the only good measures made or known in modern times. Hence Sir Henry James stands clearly convicted of two successive and wilful tamperings with the results of Great Pyramid measures; and if he can get any good scientific authority to approve of his proceedings *there*, by all means let us hear who it is and the arguments he employs for *that*.

SIR JOHN HERSCHEL.

Then the name—and truly a mighty name amongst all educated men—of Sir John Herschel is likewise brought up by Sir Henry James, with the expectation of thereby supporting himself and confounding me; but in what? I had alluded to Sir John Herschel's brilliant disquisition of thirty years ago, performed for Colonel Howard Vyse, and conclusive of the date of the Great Pyramid's building from the angular position of its entrance passage, both in azimuth and altitude, combined with the movements of the star Alpha Draconis under the influence of Precession; and I also alluded to my own discovery connecting that particular position of the entrance passage and Alpha Draconis with still more remarkable sky-places and Pyramid symbolisations of that central group of the sidereal system and general star-reference of the patriarchal ages, the Pleiades. Does Sir John Herschel, then, now at this time, upset all that older series of facts and phenomena—both his own discovered and mine—by merely allowing to Colonel Sir Henry James that the entrance passage of the Great Pyramid *may* have been used at the time of the building for transporting heavy blocks? Certainly not; for both I and others have allowed the

same thing long ago, and have shown that, while it need not interfere with that passage's first and most accurate purpose of testifying to memorial or chronologic astronomy, it cannot tend to explain any other than one only of all the numerous passage-features actually existing; and that one, viz., the vertical angle, it resembles only approximately or within wide limits. There, indeed, Sir John Herschel seems to believe Sir Henry James in his bold assertion that the entrance passage, or another passage, is at the *precise* "angle of rest" for that material; and that thereby heavy weights may be slid down its slope without incurring what he expressively calls "a down-rush." Yet if that be so, I would be obliged to those gentlemen (who have neither of them, I believe, yet seen the Great Pyramid) to explain how it came about that in *my* rather numerous measurements there, in all the inclined passages, my ladders, measuring bars, lamps, and other matters would too often slip away from the fingers that ought to have held them tighter, and *did* go down the slopes with tremendous "down-rushes," sometimes even to their own destruction? And why, also, with two pieces of the Pyramid-passage stone now in my possession, the angle of rest as shown by actual experiment is not 26 degrees 18 minutes, as with the mean passage angle, but is something under 20, possibly 18, degrees?

M. DOURSTHER.

Finally, there is a name which Sir Henry James pronounces to be one of high authority, and declares that I was "disingenuous" not to have quoted it as his very sufficient defence for those features of his Jerusalem map which I was lately obliged to condemn. But even he (Sir H. James) does not in his letter venture to mention this important name either; therefore it is left to me, after all, to name the great name to your readers, and inform them that it is that of M. Doursther, of Brussels, author of a *Universal Dictionary of Weights and Measures, Ancient and Modern*. After this most telling statement to all whom it concerns, however, it is proper for me to add that—

Firstly: If Sir Henry James *originally* wished to sail only under the broad protecting ægis of the great name of M. Doursther, of Brussels, he ought not to have engraved that name on the map in such very small characters, and his own in such very large ones as are to be seen there. And,

Secondly: That there was no occasion whatever for me, in my former letter, and its dealings with final facts, to mention M. Doursther's

name; because, so long as the statements which Sir Henry James choose to engrave touching the sacred cubit of the Hebrews and the cubit of the Tabernacle were really erroneous, contrary to Scripture, and against the writings, reasonings, pleadings of both Sir Isaac Newton, John Taylor, and myself, it relieves him, Sir Henry James, of *no* part of his responsibility that he went *voluntarily* to some source on the Continent, either pure or impure, picked up there certain anti-British and even heathenish notions, and wilfully engraved them, and them only, to the serious misleading of the public and the discredit of the Palestine Exploration Association, on their or his so-called *Ordnance* map of Jerusalem. From that position he will infallibly be obliged to remove them, if he has not done so already; and M. Doursther, found glaringly wrong, will have little reason, in the end, to thank Sir Henry James.—I am, &c.,

C. PIAZZI SMYTH.

1, Hillside Crescent, Edinburgh,

22nd October, 1869.

APPENDIX VI.

Last communication from Colonel Sir Henry James, R.E., Director-General of the Ordnance Survey, under cover marked "On Her Majesty's Service," and dated by the Post-Office, November 12, 1869.

"POSTSCRIPT,

"(*To Notes on the Great Pyramid*).

"Since the publication of these Notes I (Sir Henry James) have received a communication from Mr. Penrose, who measured the Hecatompedon, in which he says:—

"My iron tubular rods were compared by the late Mr. Simms with his standard both before and after their use at Athens. The second measurement gave them a slightly shorter length than the first, which I attributed to some molecular action induced by ordinary shaking on the road—certainly not to any other cause, as they were carefully packed, and the ends could have had no injury. By adopting a mean value of the length when used at Athens, I should assign to the Hecatompedon a measure of 101·336 feet, which, following the method of reduction to the Egyptian cubit in page 7 of your

Notes, gives the latter the length of 18·2405 inches (instead of 18·2415). This trifling modification," he adds, "does not in any degree alter the argument you adduced from them; indeed, it tends towards a still nearer agreement with the Pyramid measures.'"

APPENDIX VII.

The preceding Appendix of Nov. 12, the only thing as an answer that I have seen or heard of from the Director-General of the Ordnance Survey subsequently to his letter of October 9, so totally fails to meet any of the serious accusations against him contained in my two letters of September 23 and October 22, that in place of now still further showing the groundlessness of most of the remaining contents of his pamphlet, *Notes on the Great Pyramid*, it seems better to conclude my part of the discussion with an unsought letter received from the same Mr. Penrose alluded to by Sir Henry James, and setting forth on the whole, that he, Mr. Penrose, at least, did not consider the contents of Appendix VI. any answer to the principal and most grave charge lying at the door of the Director-General.

"St. Paul's Chapter House, London, E.C.,
Nov. 1, 1869.

"DEAR SMYTH,—Thank you for the paper (letter of October 22) on the Great Pyramid I received to-day.

"I have not taken any stand one way or the other on the questions referred to in it. Colonel Sir Henry James kindly sent me his pamphlet in which the subject was mentioned, and I found that my measurements were quoted, and as these were not the finally concluded results, but taken from a statement made by me in progress of my examination, I thought it best to send him what I thought was a correction—though a minute one.

"If he has 'cooked' the Pyramid measurements the agreement which I saw in them to the Hecatompèdon would not apply. I merely wish you to understand that I am not a partizan, but wished to contribute my mite without the blur on it.—Yours truly,

(Signed) "F. C. PENROSE."



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